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**A STUDY ON THE FUNCTIONAL PROPERTIES
OF TARO STARCHES
FROM TONGA**

PALATASA HAVEA

1993

**A STUDY ON THE FUNCTIONAL PROPERTIES
OF TARO STARCHES
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A Thesis

**presented in partial fulfilment of the
requirements for the Degree of Master of Technology
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ABSTRACT

This study compared the functional properties of three taro starches extracted from selected cultivars, one from each of the three most commonly grown taro genera in Tonga. The selected cultivars were *Alocasia macrorrhiza* var 'Fohenga', *Colocasia esculenta* var 'Lau'ila', and *Xanthosoma saggitifolium* var 'Mahele'uli'. Cassava starch, a commercial product from Thailand, was studied together with the taro starches for comparison purposes.

Freshly harvested taro corms/cormels were peeled, washed, ground into pulp. The taro pulp was washed with excess water and filtered with a cheese cloth. The solid pulp was discarded, and the water-starch mixture (starch milk) was collected in a settling tank. The starch was held for 10-24 hours to allow the starch to settle, and then the supernatant liquid was discarded. The *Xanthosoma* starch was successfully isolated using this method. For the *Alocasia* and *Colocasia*, the starch could not be isolated from the starch milk due to the presence of a mucilaginous material, and it was separated using a bowl centrifuge. The starches were dried, in a hot-air drier and then purified to remove trace of protein, fat, and fibre.

All the taro starch granules were similarly polygonal in shape but the granule sizes were different. The *Xanthosoma* starch granule size (5-30 μ m) was similar to that of cassava starch granules (5-35 μ m). The granule sizes of *Alocasia* (0.5-3 μ m) and *Colocasia* (0.5-6 μ m) were very small, smaller than rice starch granules. The amylose contents, determined using an iodometric blue value colorimetry method, were 12.1, 13.6, 19.8, and 27.4% for *Alocasia*, *Colocasia*, cassava, and *Xanthosoma* starches respectively.

The gelatinization temperatures for the starches were determined using sensory evaluation, hot stage microscopy, Brabender Amylograph, and Differential Scanning Calorimetry (DSC) methods. The gelatinization temperatures were approximately 69, 70, 75 and 80°C for cassava, *Alocasia*, *Xanthosoma* and *Colocasia* starches respectively. The gelatinization temperature ranges for *Xanthosoma* and *Colocasia*

were similar to that of cassava starch, but *Alocasia* starch showed relatively wider temperature range. The viscosity of the *Xanthosoma* gelatinized starch paste was much higher than the other starches but showed greater breakdown on heating.

The strengths of the starch gels were determined by measuring the rheological modulus G^* of the gels using a Bohlin Rheometer, and the penetration strength test using an Instron. Both tests showed that the *Xanthosoma* starch produced a much stronger and higher viscosity gel than all of the cassava, *Alocasia* and *Colocasia* starches which produced gels with similar strength. The relative order of gel clarity from qualitative sensory evaluation, from highest to poorest clarity, was cassava, *Xanthosoma*, *Colocasia*, then *Alocasia*.

The storage stability of the starch gels was evaluated by studying the crystallisation using DSC, and measuring the syneresis occurring during storage at 5 and 22°C. The *Xanthosoma* starch gel was extremely susceptible to crystallisation and syneresis during storage, compared with cassava, *Colocasia*, and *Alocasia* gels which had similar stabilities on storage. The freeze-thaw stability of the starch gels was studied by subjecting the starch gels to repeated freeze-thaw cycles. The *Xanthosoma* starch gel was extremely unstable with freeze-thaw treatment. The *Alocasia* and *Colocasia* starch gels were similar to cassava starch gel which was more stable with freeze-thaw treatment.

The *Xanthosoma* starch, because of extremely high viscosity and gel strength, could be use in food products that need high viscous texture but require no further storage. The *Colocasia* and *Alocasia* starches, because of high digestibility due to very small granule sizes can be used in baby food formulations, which are either heat treated or frozen.

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TABLE OF CONTENTS

ABSTRACT	I
ACKNOWLEDGEMENTS	III
TABLE OF CONTENTS	V
LIST OF APPENDICES	IX
LIST OF TABLES	X
LIST OF FIGURES	XI

CHAPTER

1	INTRODUCTION	1
1.1	Taro Production and Uses in Tonga	2
1.2	Taro Botany	5
1.3	The Chemical Composition of Taro	7
1.4	Taro Starch	11
2	LITERATURE REVIEW: THE FUNCTIONAL PROPERTIES OF TARO STARCH IN COMPARISON TO OTHER INDUSTRIAL STARCHES	13
2.1	Introduction	13
2.2	Starch Granules: Morphological and Molecular Structure	14
2.3	Gelatinization Phenomenon	19
2.4	Swelling Power	24
2.5	Gel Strength	25
2.6	Paste Clarity	26
2.7	Factors affecting the gelatinization of Starches	27
2.7.1	Effect of Moisture	27
2.7.2	Effect of pH and Other Solutes	28
2.7.3	Effect of Lipids and Proteins	29
2.8	Relationships of Functional Properties to the use of Different Starches in Foods	29
2.8.1	Starch Modifications	30
2.8.2	Thickening Agents	30

2.8.3	Emulsifying and Stabilizing Properties	31
2.8.4	Freeze-Thaw Properties	31
2.8.5	Starch Retrogradation	34
2.8.6	Binding and Bulking Properties	35
2.9	Concluding Remarks	37

3 MATERIALS AND METHODS

3.1	Raw Materials	37
3.1.1	The Starch Extraction Process	41
3.2	Starch Purification	44
3.3	Starch Granule: Morphological and Molecular Structure	45
3.3.1	Morphological Structure	45
3.3.2	Molecular Structure	46
3.4	Starch Gelatinization	46
3.4.1	Sensory Evaluation Method	46
3.4.2	Hot Stage Microscope Method	47
3.4.3	Brabender Amylograph	47
3.4.4	Differential Scanning Calorimetry Method	48
3.4.5	Swelling Power	50
3.5	Functional Properties of Starch	52
3.5.1	Gel Preparation	52
3.5.2	Gel Strength	52
3.5.3	Gel Clarity and Texture	56
3.5.4	Crystallization	57
3.5.5	Development of Opacity	57
3.5.6	Syneresis	58
3.6	Freeze-Thaw Stability of Taro Starch Gels	58
3.6.1	Thermoproperties	58
3.6.2	Tensile and Penetration Strengths of Starch Gels	59
3.6.3	Syneresis	60
3.6.4	Crystallisation	61

4	STARCH EXTRACTION AND PURIFICATION	62
4.1	Introduction	62
4.2	The Starch Extraction Method	62
4.2.1	Raw Material	63
4.2.2	The Processing	65
4.2.3	Transport of Raw Materials to New Zealand	66
4.2.4	Starch Purification	66
4.3	The Extraction Process	67
4.3.1	The Peeling of Taro	67
4.3.2	Grinding of Taro to Produce Taro Pulp	68
4.3.3	The Starch Extraction Process	69
4.3.4	The Starch Settling Process	70
4.3.5	Starch Separation Using Centrifuge	72
4.3.6	The Drying Process	73
4.4	Starch Yields	76
4.5	Starch Purification	77
4.6	Conclusion	79
5	PHYSICAL AND MOLECULAR CHARACTERISTICS	80
5.1	Introduction	80
5.2	The Starch Granule Physical Characteristics	80
5.2.1	Results	80
5.2.2	Discussions	83
5.3	Amylose Content	84
5.3.1	Introduction	84
5.3.2	Results	85
5.3.3	Discussion	85
5.4	General Discussions	86
5.5	Conclusions	88

6	STARCH GELATINIZATION	89
6.1	Introduction	89
6.2	Sensory Evaluation	89
6.2.1	Introduction	89
6.2.2	Results	89
6.2.3	Discussion	90
6.3	Hot Stage Microscope	91
6.3.1	Introduction	91
6.3.2	Results	91
6.3.3	Discussion	91
6.4	Brabender Amylograph	92
6.4.1	Introduction	92
6.4.2	Results	92
6.4.3	Discussion	94
6.5	Differential Scanning Calorimetry (DSC)	96
6.5.1	Introduction	96
6.5.2	Results	96
6.5.3	Discussion	99
6.6	Swelling Power	101
6.6.1	Introduction	101
6.6.2	Results	102
6.6.3	Discussion	102
6.7	General Conclusions	103
7	THE FUNCTIONAL PROPERTIES OF THE TARO STARCH GELS	104
7.1	Introduction	104
7.2	Gel Strength	104
7.2.1	Rheological Measurement	104
7.2.2	Instron Measurement	105
7.2.3	Results	105
7.2.4	Discussion	107
7.3	Gel Crystallisation	109

7.3.1	Results	110
7.3.2	Discussion	111
7.3.3	Gel Clarity	113
7.4	Syneresis	116
7.5	Freeze-Thaw Stability of Taro Starch Gels	118
7.5.1	Thermoproperties of Freeze-Thawed Taro Starch Gels	118
7.5.2	Tensile and Penetration Strength of Starch Gels	130
7.5.3	Syneresis	134
7.5.4	Gel Crystallisation	136
7.6	Conclusions	138
8	GENERAL DISCUSSION AND CONCLUSIONS	139
8.1	Introduction	139
8.2	The Starch Extraction Process	139
8.3	The Granule Physical Characteristics	140
8.4	The Starch Molecular Characteristics	141
8.5	The Functional Properties of the Starches	142
8.5.1	The Gelatinization Properties	142
8.5.2	Properties of the Starch Gels	145
8.6	General Conclusions	149
	REFERENCES	150

LIST OF APPENDICES

1	Chemical compositions of <i>Colocasia</i> , <i>Xanthosoma</i> , and <i>Alocasia</i>	162
2	Method of selection of taro cultivars for the study	165
3A	A sample of recorded data from a Bohlin rheometer (oscillation mode)	168
3B	A sample of typical plot from the Bohlin rheometer measurement (oscillation mode)	169

LIST OF TABLES

1.1	Taro (<i>C. esculenta</i>) composition of corms and leaves from different sources	8
1.2	The main components of Taro corms and cormels	10
1.3	Starch contents of various root tubers	11
2.1	Starch granule size of different cultivars of <i>Colocasia</i>	16
2.2	Total and soluble amylose contents of <i>Colocasia</i> Starch	17
4.1	Raw material and starch extraction results	64
4.2	Protein, fat, and dietary fibre contents of raw taro starches	77
5.1	Physical characteristics of starch granules	83
5.2	Amylose contents of taro starches	85
6.1	Gelatinization temperature (manually measured)	90
6.2	Gelatinization temperature (Hot stage microscope)	91
6.3	Brabender Amylograph characteristics	93
6.4	Gelatinization characteristics of taro and cassava starches measured by DSC	98
6.5	Swelling power of cassava and taro starches at 85°C	102
7.1	Complex modulus G^* (Pa) of 5% w/w starch gels at 25 and 90°C	106
7.2	Measured penetrating force (N) required to plunge the starch gels	107
7.3	Crystallisation of starch gels after storage at 5 and 22°C for 10 days measured by DSC	110
7.4	Water separated from the starch gels (% Syneresis) after storage	117

7.5	Effect of freeze-thaw treatment on starch gels	121
7.6	Penetrating strength of freeze-thaw treated taro starch gels	131
7.7	Effect of storage time on penetrating strength of starch gels	132
7.8	Crystallisation of freeze-thaw treated starch gels	137

LIST OF FIGURES

1.1	The taro plant	6
2.1	Starch granules of potato and rice starches (light microscopy)	14
2.2	Starch granules under polarized light	14
2.3	Taro (<i>C. esculenta</i>) starch granules	15
2.4	Viscosity behaviour of cassava starch	21
2.5	Brabender amylogram of taro <i>Colocasia</i> starch	23
2.6	Change in starch paste reflectance during storage at 4°C	32
2.7	Cold storage stability of various starches as measured by water separated from the gel during storage at 5°C	33
2.8	Freeze-thaw stability of various starches as measured by water separated from the gel after storage and thawing	33
2.9	Formation of starch precipitates at low starch concentration	34
3.1	Taro <i>Colocasia</i> corms	38
3.2	Taro <i>X-sagittifolium</i>	39
3.3	Giant Taro (<i>Alocasia macrorrhiza</i> var 'Fohenga')	40
3.4	Giant Taro corms at Apia market	40
3.5	A home designed motor driven grinder	42

3.6	Extraction of starch by manual mixing of taro pulp	43
3.7	A hot air-drier, designed for drying starch	43
3.8	Flow chart for starch extraction process	44
3.9	Brabender Amylograph	48
3.10	DSC system showing the control system	49
3.11	Apparatus for swelling power determination	51
3.12	C25 measuring system of the VOR Bohlin Rheometer	53
3.13	Two components of deformation stress	54
3.14	Relationship between G^* , G' , and G'' moduli	55
3.15	The cone shaped device used for Instron penetration of the starch gels	56
3.16	Dimensions of gel rings for tensile testing using the Instron	60
4.1	Hot air drier used to dry starch in Tonga	73
4.2	Removable top side of starch drier built in Tonga	74
4.3	Hair driers used as sources of hot air in starch drier built in Tonga	75
5.1	Photomicrographs of taro starch granules, under (x 10,000) power magnification	81
5.2	Micellar structure and mechanism of swelling of starch granule	87
6.1	Brabender Amylograph	93
6.2	DSC endothermic peaks of gelatinization	97
7.1	Complex modulus G^* of 5% starch gels, a measure of gel strength	106
7.2	Two sets freshly prepared 5% (w/w) starch gels, before storage at 5°C and 30°C respectively	114
7.3	Starch gels after storage for 10 days at (a) 5°C, and (b) 30°C	115

7.4	Effect of freeze-thaw treatment on 5% <i>Xanthosoma</i> starch gel	119
7.5	Effect of freeze-thaw treatment on 5% <i>Alocasia</i> starch gel	120
7.6	Effect of freeze-thaw treatment on 5% <i>Colocasia</i> starch gel	120
7.7	Effect of freeze-thaw treatment on 5% Cassava starch gel	121
7.8	5% <i>Xanthosoma</i> starch gel effect of storage time	126
7.9	5% <i>Alocasia</i> starch gel effect of storage time	127
7.10	5% <i>Colocasia</i> starch gel effect of storage time	127
7.11	5% Cassava starch gel, effect of storage time	128
7.12	Sample rheological measurement error	129
7.13	% Syneresis of freeze-thaw treated taro starch gels	135
7.14	Crystallisation of freeze-thaw treated starch gels	136